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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/811,356

03/25/2004

Oliver P. Sohm

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TEXAS INSTRUMENTS INCORPORATED

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EXAMINER

YAARY, MICHAEL D

ART UNIT

PAPER NUMBER

2193

NOTIFICATION DATE

DELIVERY MODE

06/06/2007

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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# Office Action Summary

Application No.

10/811,356

Applicant(s)

SOHM, OLIVER P.

Examiner

Michael Yaary

Art Unit

2193

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 25 March 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-11 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

***DETAILED ACTION***

1. Claims 1-11 are pending in the application.

***Claim Rejections - 35 USC § 103***

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sayegh (US Pat. 5,293,330) in view of Brockmeyer et al. (hereafter Brockmeyer)(US Pat. 6,591,284).

4. **As to claim 1**, Sayegh discloses performing a first stage radix-R butterfly computations on all the input data producing R independent intermediate data sets (Abstract, lines 1-22; column 4, lines 1-24); successively performing second and all subsequent stage butterfly computations on each independent intermediate data set in turn producing corresponding output data (column 2, line 54-column 3, line 7 and column 6, lines 16-22).

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5. Sayegh does not disclose having a data cache smaller than the data set of the Fast Fourier Transform. However, Brockmeyer discloses having a data cache smaller than the data set of the Fast Fourier Transform (column 7, lines 21-36).

6. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Sayegh, by having smaller memory configurations, including cache, as taught by Brockmeyer, for the benefit of increasing CPU speed (Brockmeyer column 7, lines 35-36) and minimizing memory space and power consumption in a signal processor (Brockmeyer column 1, lines 42-43).

7. **As to claim 2**, Brockmeyer discloses each of said R independent intermediate data sets fits within the data cache (Inherent in column 11, lines 45-65 as disclosed is minimal memory size being used, thus cache would be used for minimal space and increasing CPU speed.).

8. **As to claim 3**, Sayegh further discloses said radix-R is radix-2 (abstract, lines 19-20).

9. **As to claim 4**, Sayegh further discloses said radix-R is radix-4 (abstract, lines 19-20).

10. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sayegh in view of Brockmeyer as applied to claim 1 above, and further in view of Shridhar et al. (hereafter Shridhar)(US Pat. 6,366,937).

11. **As to claim 5**, Sayegh further discloses said step of performing a first stage radix-R butterfly computations on all input data includes dividing said input data into R continuous sets (column 5, line 62-column 6, line 22), and disposing said input data into memory (column 5, lines 62-63).

12. Sayegh and Brockmeyer do not disclose each R continuous set in continuous memory locations with a space in memory locations equal to the size of a cache line between adjacent sets.

However, Shridhar discloses each R continuous set in continuous memory locations with a space in memory locations equal to the size of a cache line between adjacent sets (column 9, lines 58-60).

13. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Sayegh and Brockmeyer, by implementing a cache with cache lines storing identical amount of data, as taught by Shridhar, for the benefit of performing a Fast Fourier Transform with reduced computation time.

14. Claims 6-9 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wadleigh (US Pat. 6,088,714) in view of Sayegh.

15. **As to claim 6**, Wadleigh discloses comparing the data set of input data and twiddle factors with the size of the cache (column 2, lines 65-67); if said data set is smaller than said data cache performing said Fast Fourier Transform in  $\text{Log}_R N$  stages on all the data set in one pass (Column 1, line 46-column 2, line 64 disclose a 6 step method to performing a Fast Fourier Transform when the data set is larger than the cache, thus when the data set is smaller than the cache the transform is performed on the data in one pass.); the data set is larger than said data cache but smaller than  $R$  times the data cache (column 2, lines 65-67).

16. Wadleigh does not disclose performing a first stage radix- $R$  butterfly computation on all the input data producing  $R$  independent intermediate data sets in a first pass; successively performing second and all subsequent stage butterfly computations on each independent intermediate data set in turn producing corresponding output data in second passes.

However, Sayegh discloses performing a first stage radix- $R$  butterfly computation on all the input data producing  $R$  independent intermediate data sets in a first pass (Abstract, lines 1-22; column 4, lines 1-24; successively performing second and all subsequent stage butterfly computations on each independent intermediate data set in

turn producing corresponding output data in second passes (column 2, line 54-column 3, line 7 and column 6, lines 16-22).

17. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Wadleigh, by incorporating a multi stage butterfly computation, as taught by Sayegh for the benefit of producing real-time, very high speed signal processing.

18. **As to claim 7**, Wadleigh further discloses said Fast Fourier Transform uses complex input data and complex twiddle factors of M bytes each (column 1- line 61-column 2, line 11); said step of comparing data set with the size of data cache compares the data cache size to 4 NxM bytes (column 2, line 38-64).

19. **As to claim 8**, Sayegh discloses said radix-R is radix-2 (abstract, lines 19-20).

20. **As to claim 9**, Sayegh discloses said radix-R is radix-4 (abstract, lines 19-20).

21. **As to claim 11**, the claim is rejected for the same reasons as claim 6 above.

22. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wadleigh and Sayegh as applied to claim 6 above, and further in view of Shridhar.

23. **As to claim 10**, Sayegh discloses said step of performing a first stage radix-R butterfly computations on all input data includes dividing said input data into R continuous sets (column 5, line 62-column 6, line 22), and disposing said input data into memory (column 5, lines 62-63).

24. Wadleigh and Sayegh do not disclose each R continuous set in continuous memory locations with a space in memory locations equal to the size of a cache line between adjacent sets.

However, Shridhar discloses each R continuous set in continuous memory locations with a space in memory locations equal to the size of a cache line between adjacent sets (column 9, lines 58-60).

25. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the teachings of Wadleigh and Sayegh, by implementing a cache with cache lines storing identical amount of data, as taught by Shridhar, for the benefit of performing a Fast Fourier Transform with reduced computation time.



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***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Yaary whose telephone number is (571) 270-1249. The examiner can normally be reached on Monday-Friday, 8:00 a.m - 5:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng-Ai An can be reached on (571) 272-3756. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

MY

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